

Renewable Resources: The New Texas Energy Powerhouse

A report on the economic benefits of renewable energy in Texas
and how to keep them growing



About this report

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Additional copies of this report cost \$25.00 and may be ordered from

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Foreword

Given that environmental groups rarely have the opportunity to issue reports with good economic and environmental news, we are very pleased to offer this report on the positive progress of renewable energy in Texas.

We feel that the report underlines a vital lesson: today's environmental problems, no matter how daunting, are not without solutions. In most cases, protecting public health and our natural heritage is not only a matter of finding the solutions but finding the political will to move them forward. Renewable energy is a case in point. Since the late 1980's, a number of organizations in Texas – Public Citizen's Texas office, Environmental Defense, Texas Fund for Energy and Environmental Education – have articulated a vision that many of the state's pollution problems could be addressed by initiating a transition from dirty power sources to renewable energy.

A decade later, we are able to measure real progress, not projections. There is now a powerful and burgeoning renewable energy industry in Texas. Already employing thousands of Texans and paying millions in tax dollars, renewable energy is proving that it is part of environmental and economic solutions in Texas.

This report measures not only where we are today but where we can go tomorrow with the necessary vision and leadership. Texas is poised to lead world renewable energy development in the 21st century much as it led the world in oil and gas technologies during the 20th.

It is our hope that all Texans – citizens, business leaders, policymakers, and workers – will join in recognizing the value that renewable energy offers to Texas, and to assure that we accept that offer.

Peter Altman

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September, 2002

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Executive Summary

Wind power is delivering significant economic benefits to Texas and has the potential to be a major economic force in the future.

Fewer than six years after the state's first commercial utility-scale wind power plant was installed, Texas has 1,100 Megawatts of wind power on the ground. In response to the Texas legislature's renewable energy requirement, utilities and wind companies invested \$1 billion in 2001 to build 912 Megawatts of new wind power projects.

With the right policy mix, renewable energy will be a multi-billion dollar industry employing thousands of Texans and paying hundreds of millions in taxes.

The completed plants created 2,500 quality jobs with a payroll of \$75 million, will deliver \$13.3 million in tax revenue for schools and counties and pay landowners \$2.5 million in royalty income in 2002 alone. The multiplier effect of this new investment activity will stimulate another 2,900 indirect jobs in Texas. Wind power is bringing relief to rural Texas and creating jobs statewide.

This current stream of new economic activity only foreshadows what Texas can achieve. Texas' renewable energy potential is enormous—more than ten times greater than all electricity currently sold in Texas. With such an abundance of natural resources, Texas can be a global leader in the renewable energy field much as it dominated the 20th century with fossil fuels.

By 2020, wind power in Texas could be responsible for 8,500 direct jobs with a payroll of \$255 million. It could create another 9,800 indirect jobs, provide \$216 million annually in local taxes and pay landowners in windy regions \$30 million each year. An industry of that scale would be generating \$1.4 billion worth of electricity annually.

Unleashing that success will largely depend upon the will of Texas leaders, who have the power to create a stable, consistent policy base on which wind's investors and developers can depend. Texas can achieve its potential in renewables with policies that:

- 1) Stimulate cost-effective development by setting state and federal goals for renewables to meet 10% of our electricity use by 2020;
- 2) Add transmission infrastructure to move wind-generated power to cities;
- 3) Extend the federal Production Tax Credit long-term;
- 4) Create a verifiable registry of emissions and reductions to make Texas more appealing to renewable energy developers seeking pollution credits;
- 5) Create and support university and other training programs to prepare Texans to work in the renewable energy industry.

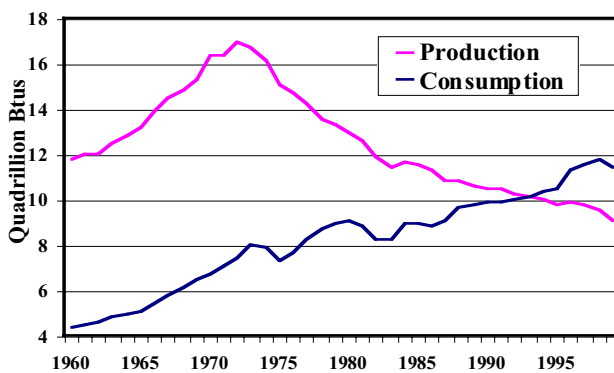
Renewable energy is providing great economic value for Texans. With clear and deliberate goals, renewable energy can grow to a multi-billion dollar industry that puts Texans all over the state to work. Leadership is all that is needed.

Introduction

Texas' history in the 20th century is inextricably tied to oil and gas development. Fossil fuels have driven the Texas economy, created job opportunities for millions and funded vital state services. As these resources decline, renewable energy—primarily in the form of wind power—is creating new economic opportunities for Texans, pumping millions into the economy and evolving into an increasingly important industry.

This opportunity is timely, since Texas continues to import a growing fraction of its energy. Texas is also laboring from a number of air pollution problems including urban smog and haze pollution. Stable and consistent policies will unleash the potential for Texas to diversify its energy resources with renewable energy and drive development of an industry in which Texas can be a world class leader. Texas' bountiful natural resources, combined with innovative energy policies, helped fuel \$1 billion in investments in wind power plants during 2001.

Texas Has Become a Net Energy Importer



Source: Texas Energy Coordinating Council Final Report, August 2002

These new clean energy projects are bringing economic benefits to Texans statewide while reducing the harmful environmental and health impacts of conventional electricity production.

But the promise of renewable energy is not enough by itself. Over the last 25 years, renewable energy policy in the United States has been an 'on again, off again' affair, causing a constant cycle of boom and bust which has hampered the industry. Yet in Texas, over the concerns of critics who cited cost, reliability and novelty as reasons to avoid renewable energy, it has shown its potential. It is clear

that renewable energy will have much more to offer given policies that create a stable and consistent foundation on which to build.

Such policies include setting firm goals for the use of renewables, supporting existing tax incentives and speeding up transmission line development. Texas should pursue policies to make the state's renewable energy potential more attractive to developers seeking emissions reduction credits and develop training programs to assure its young people a place in the renewables industry.

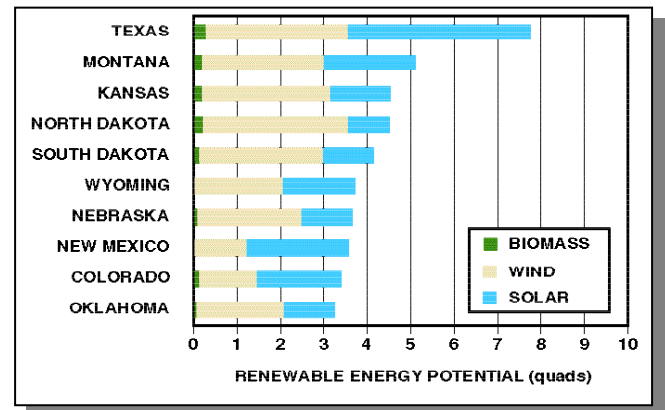
This report examines the economic benefits Texas is seeing as a result of its first steps into renewable energy. It explores how much more the renewable energy industry could do for Texans if growth in renewables is supported and expanded further. It discusses various policy options that would move renewables forward at little or no cost to the Texas consumer. It is an in-depth companion to the brochure "What Renewable Energy Means to Texas."

The Texas Success Story

Texas has long relied on renewable energy to meet basic needs. As early as the 19th century windmills pumped water for farmers and ranchers in west Texas and the state's first hydroelectric dams generated power for central Texans.

Recent years have seen the start of the modern era of Texas' renewable energy story. Texas leads the nation in solar and biomass (organic and agricultural wastes) potential and is a close second to North Dakota in wind energy. With those three energy sources, Texas has more renewable energy potential than any other state. Wind energy is developing rapidly because it is currently the most cost-competitive energy source, generally competitive with electricity generated by natural gas plants.

In just a few short years Texas has leapt from being a bystander to being a major player in renewable energy. Texas' renewable energy policies have made this leap possible by allowing investors and utility companies to take advantage of the rapidly declining cost of wind energy. In 1999 the Texas Legislature created a Renewable Energy Portfolio standard which set mandatory goals to generate a growing percentage of the state's electricity through renewable resources but uses market forces in the form of tradable credits to get there.



Source: Virtus Energy Research Associates

Texas' RPS program requires 2,000 Megawatts of new renewable energy resources to be added in the state by 2009. This requirement is sensibly staged in a series of increments building to the ultimate goal: 400 MW by 2003; 850 MW by 2005; 1,400 MW by 2007 and finally 2,000 MW of new capacity by 2009. The Texas program also has provisions that recognize 880 MW of existing renewable resources – consisting primarily of decades old hydroelectric facilities – and requires that these remain in use or be replaced by additional new capacity. The large wind installations in Texas are among the lowest cost sources of wind power in the world. In 2001 Texas installed more wind power than the entire U.S. had ever installed in any previous year.

The industry's success is no longer measured in Megawatts alone. Today, we can point to the economic, pricing and environmental benefits as we measure the success of renewable energy.

Solar



Used with permission from Green Mountain Energy Company

Wind



Courtesy of Cielo Wind Power

Biomass



Courtesy of Warren Gretz and DOE / NREL

Texas Wind Power Projects installed in 2001 - 912 MW



Llano Estacado wind power project

Courtesy Cielo Wind Power



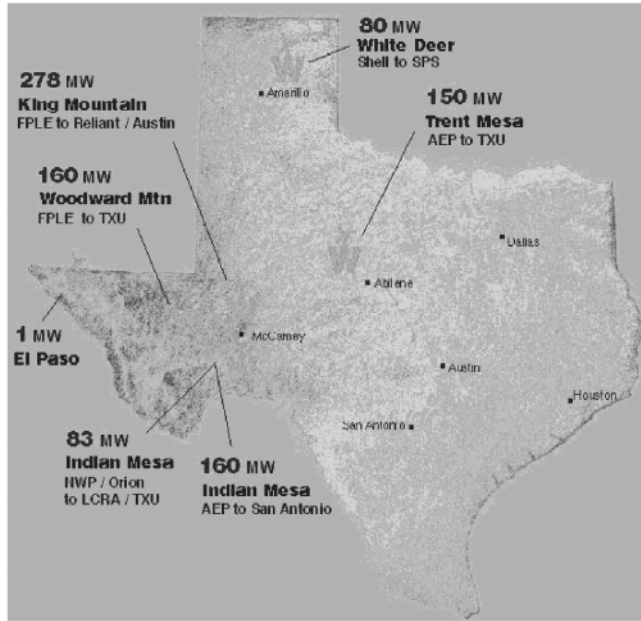
King Mountain wind power project

Courtesy Cielo Wind Power

Texas Wind Power Projects Installed During 2001

Wind Project	Capacity (MW)	Location	Who Gets the Power?	Owner
King Mountain	278.2	Upton Co.	Reliant (198.9) Austin Energy (79.3)	FPL Energy
Desert Sky	160.5	Pecos Co.	CPS	AEP
Woodward Mtn	159.7	Pecos Co.	TXU	FPL Energy
Trent Mesa	150.0	Taylor Co.	TXU	AEP
Indian Mesa	82.5	Pecos Co.	LCRA (50) TXU (32.5)	NWP-Orion
Llano Estacado	79.3	Carson Co.	SPS	Shell
Hueco Mountain	1.3	Hudspeth Co.	El Paso Electric	El Paso Electric

Wind Power Installed in Texas in 2001



Trent Mesa wind power project

Photo by Peter Altman



Woodward Mountain wind power project

Courtesy Cielo Wind Power



Indian Mesa wind power project

Courtesy Cielo Wind Power

Economic Benefits¹

The 912 Megawatts of resources built in a single year in response to the Texas RPS represent \$1 billion of capital investment in rural Texas, delivering a spectrum of substantial benefits to the state as a whole, to local economies and to individual businesses and citizens. The benefits include local tax payments, jobs, royalty payments, business opportunities, as well as gains from the multiplier effect.

With the 178 MW of wind power built before 2001, Texas now has 1,100 MW creating jobs, paying taxes and boosting local economies.

Local Taxes

Capital-intensive wind power plants bring substantial new tax revenue to windy regions. For example, Pecos County is projected to receive \$4.6 million in tax payments during 2002 from three new wind plants built there during 2001.

Although school taxes are the biggest, most counties in Texas also collect a variety of property taxes to pay for items ranging from basic county services, hospitals, water districts, fire protection and community colleges. Collectively, the balance of non-school taxes typically amounts to about 1% of taxable value. That would generate nearly \$8 million dollars based on the statewide \$777 million wind tax base present today if not for tax abatements, which are granted to wind power projects as they are to many industries. Tax abatements



"If it wasn't for wind energy, I don't know what our schools would have done. Wind energy has stepped in at just the right time for us"

**Mayor Sherry Phillips
McCamey, Texas**

Photo by Peter Altman

Property Taxes Paid to School Districts by Texas Wind Projects

based on tax assessor estimates for 2002

County	Installed Wind (MW)	Assessed Value (\$ million)	Tax Rate (%)	Tax Due in 2002
Pecos	412.7	297.05	1.62	\$4,809,472
Upton	292.3	191.00	1.44	\$2,750,400
Crockett	61.0	47.50	1.33	\$631,750
Taylor	100.5	81.98	1.38	\$1,131,324
Nolan	49.5	37.60	1.58	\$594,080
Carson	80.0	57.50	1.49	\$856,750
Culberson	65.0	34.88	1.55	\$470,028
Howard	34.3	24.71	1.50	\$370,656
Jeff Davis	6.0	4.32	1.50	\$64,800
Hudspeth	1.3	0.95	1.50	\$14,256
Total	1,102.6	777.4818	1.49%	\$ 11,614,460

Source: Analysis by Virtus for SEED / Public Citizen's Texas office

substantially reduce the collections for non-school services. In the case of wind power plants, typical abatement periods are from 5 to 10 years, although in a few cases wind projects pay full taxes the first year.

As Texas contemplates creative solutions to boost school funding, enabling additional wind development should be high on the list of options. The potential of wind to quickly become a significant source of school funding in rural areas is powerfully demonstrated by Pecos County.

The debut of wind in Pecos County, where the initial three plants are expected to produce electricity worth close to \$40 million per year, foreshadows the potential of wind as a major source of financial support for schools and rural county services.

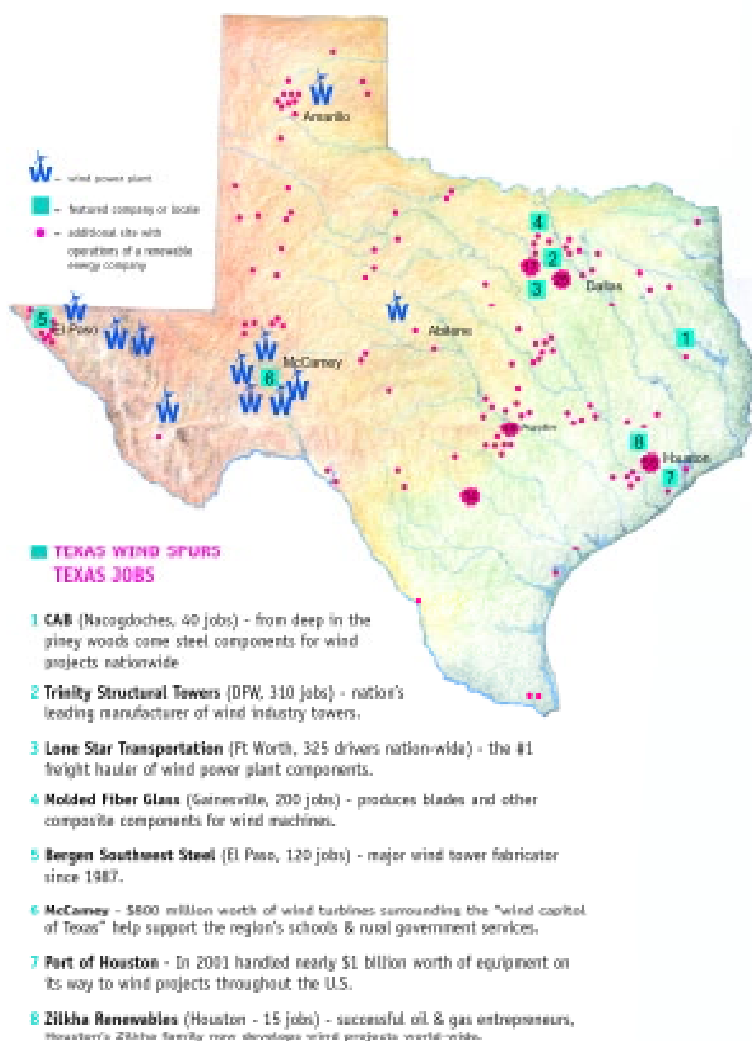
In just one year, nearly \$300 million in wind assets added 14% to the county's total tax base. This sizable boost is particularly impressive since Pecos County already has considerable taxable assets—it is ranked among Texas' top ten oil-producing counties.

Wind-related Jobs and Manufacturing

Wind power creates jobs in the manufacturing, transportation, and installation of components as well as the ongoing operation of plants. But the majority of wind-related jobs are in manufacturing. With its expertise in heavy industry perfected in the oil patch, Texas is a natural source for towers, structural supports and heavy hauling. For example, Fort Worth based Lone Star Transportation has become the nation's leader in wind power transportation. Several steel companies such as Bergen Southwest Steel, Trinity Structural Towers and Vessel Technologies have played a role in Texas' wind boom of 2001, supplying wind tower components.

Construction Jobs

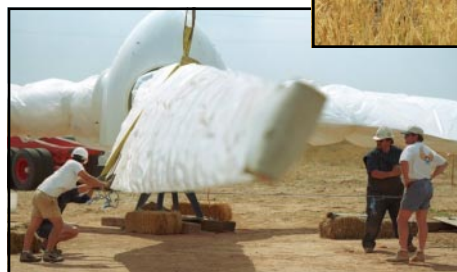
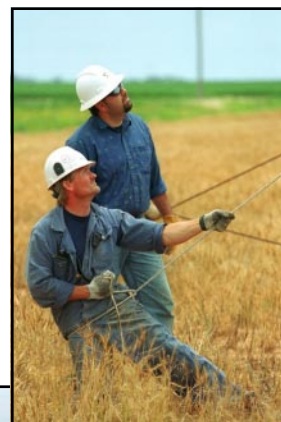
A wind farm needs up to 300 workers on-site at one time during construction. Activities range from building roads, erecting equipment or laying cable for the remote operations monitoring. Wind farms, unlike conventional power plants, are quickly installed, usually in less than a year. From the start of construction through the first year of operation, Texas wind farms need approximately 1.3 person-years of labor per mega-



watt². During 2001, it is estimated that Texas required 1185 person-years of labor to construct 912 MW of wind power plants.

Servicing Jobs

After the intensive construction phase, wind farms retain people on-site to monitor and maintain the power plant. Here is another example in which economies-of-scale play a part in making the operations and management more efficient on bigger farms. The number of workers needed varies but averages to .06 per megawatt of capacity (or 1 worker per 17 MW of capacity). A typical 150 MW wind plant will have about 9 permanent workers. The service jobs created by wind plants are significant quality jobs in rural Texas where the job base is shrinking.



Photos courtesy
Cielo Wind
Power

Total Wind-Related Jobs

Texas' current job base of wind-related employment comes to 2,500 statewide for our roughly 1,100 MW of wind power. This figure includes jobs from wind plant construction, major wind component manufacturers, and employment at small wind companies within the membership of the Texas Renewable Energy Industries Association. That is roughly equal to the 1998 estimates in a study for the State Energy Conservation Office, which projected 4,300 jobs under a scenario where new renewable capacity reaches 1,981 MW by 2010³.

Landowner Benefits

Landowners in many windy regions of Texas have leased their property to wind developers for the purpose of building major wind farms. These surface leases pay landowners annual royalty payments of about \$2,000 annually per turbine for a term of 25 years. The royalties are helping sustain long-time farmers and ranchers whose traditional livelihoods have become more and more difficult to sustain. Since wind turbines are spaced far apart, they are very compatible with agricultural uses such as cattle grazing and farming. Even with the roads that are built to service the turbines, more than 95% of the land is left free for other uses.



Lone Star Transportation, with 300 employees, is the nation's biggest shipper of the big towers and blades the wind industry needs.

Photo by Peter Altman

New Opportunities in the Energy Industry

Many companies with a rich tradition in oil and gas are beginning to diversify their operations to include wind energy and solar power—the world's two fastest growing energy industries. Large energy companies like Shell, BP, and Texaco Chevron, as well as colorful Texas oilmen like T. Boone Pickens and Selim Zilkha are making significant investments in clean energy ventures. Local small businesses also recognize the opportunities that large-scale investment is bringing to local communities.

Economic multiplier

Economic benefits derived from wind farms are both direct and indirect. Direct benefits include on-site expenditures and electrical or special trade contractors hired to build, operate and maintain wind projects. The indirect benefits occur when a contractor or vendor receives payment for goods or services delivered and is then able to pay others who support their own businesses. It includes equipment manufacturers and wholesalers who provide the new technologies. It also includes such people as the banker who finances the contractor, the accountant who keeps the books for the vendor, and the building owner where the contractor maintains local offices.

The construction companies make use of local businesses, such as hardware and supply stores. Workers' wages are spent on area services such as hotels and restaurants. Local sales taxes increase and enhancements are often made directly to a community's local infrastructure, so it is able to handle larger trucks, electricity needs, phone service, etc. An initial estimate of the multiplier effect for the wind industry provided by the Texas Comptroller's office uses 1.15 indirect jobs created for every 1 direct wind job⁴.

"Wind power has really been an asset to this part of the country. Most everything is oil related . . . since the oil has gone down any new activity in the area is good. With the crews in here building of course I fed most of them everyday. Its been good to me and I think for everyone in town."

***Bill Long,
Owner and Proprietor of
Benoit's Restaurant,
McCamey Texas***



I've been in agriculture all my life...the agrarian economy suits me, but its not as lucrative as the revenue from the wind turbines. I don't have to work quite as hard or quite as long since the wind turbines are here.

***Louis Woodward,
Texas farmer/rancher***

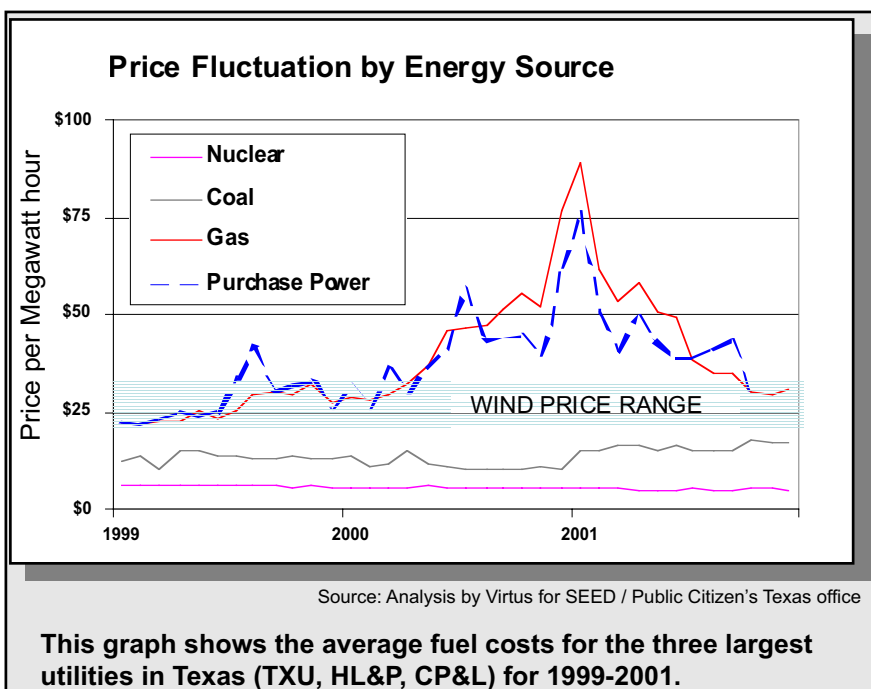
Photo by Jim Lincoln
Provided Courtesy of Landscapes Magazine

Pricing and Other Benefits

Texans enjoy some of the most competitive wind prices in the world, with some contracts priced at less than 3¢/kWh. This low price is achieved in part by the federal production tax credit, which reduces the cost of wind-generated electricity by 1.5¢ per kilowatt-hour (kWh).

Price Stability

Because natural fuels such as wind and sunshine are free for the taking, plants that rely on these clean fuels are not subject to the fuel price risks that confront traditional energy sources. Most new power plants in Texas are fueled by natural gas. Throughout much of 2001, electricity from natural gas plants cost more than that from wind plants.



While the initial cost of a gas-fired power plant is lower than coal, wind and other options, the natural gas fuel needed to operate those plants has demonstrated substantial price volatility in recent years. In comparison, wind powered electricity has no fuel cost and contracts are attainable at prices that are fixed for 25 years.

Although nuclear power plants are by far the most expensive major power plants in Texas, the cost of the fuel that goes into them is low, only about 0.4 cents per kWh. Fuel for coal plants is somewhat more expensive,

coming in the range of between one and two cents per kWh. For a number of reasons, natural gas markets have become volatile during the past few years, with average prices ranging from two to nine cents per kWh. Since natural gas produces more than half the electricity in Texas, natural gas prices strongly influence spot market prices for electricity. The average cost of wholesale power purchased by the three utilities (the dashed line on the "Price Fluctuation by Energy source chart) reflects this reality.

Wind becomes the preferred source of power when natural gas costs spike very high. It thus has a price-dampening effect on natural gas and steadies electric bills. Wind is a very reasonable and justifiable component in a diversified portfolio of resources when long-term wind power contracts price the resource at three cents per kWh or less.

Recently the Union of Concerned scientists conducted an analysis of the price benefits of wind power over a twenty year period and found that in 2020, consumers would save at least \$120 million and as much as

\$550 million a year by if natural gas prices were to increase by 35%, a likely scenario given the growing demand for gas⁵.

Fuel Diversity

Just as diverse portfolios protect investors, diverse energy supplies protect consumers. Texas' current mix of fuel relies primarily on gas, coal and nuclear fuels. Each of these has benefits and challenges. Natural gas, the most popular fuel, has a volatile price range that is passed on to the consumer. Coal is relatively inexpensive but may be subject to costly retrofits on plants to comply with new environmental regulations for pollution reduction. While nuclear fuel is itself inexpensive, the construction of Texas' nuclear power plants has been extremely expensive. Furthermore, radioactive waste poses a dangerous disposal issue on which billions of federal dollars have been spent.

Energy security

Terrorism in the United States is a real threat. Large, centrally located power plants provide most of Texas' electricity. Should one of these plants experience an attack, repairs could take more than a year, possibly creating power shortages on a scale that Texans have never suffered before. Coal trains and gas pipelines are also vulnerable to disruption. Wind power plants are quickly installed and repaired. The modular structure of a wind farm also means that if one turbine is damaged, the overall output of the plant is not significantly affected.

Public Health and Environmental Benefits

Wind and solar power plants emit no air pollutants as they generate electricity. In contrast, electric power plants cause about 58% of Texas' sulfur dioxide emissions and 20% of Texas' nitrogen oxide emissions. In addition, Texas' electric utilities are the source of 33% of the state's emissions of carbon dioxide, the principal global warming gas. While wind is largely displacing natural gas generation at the moment, renewable energy has the potential to take the place of some of our dirtier coal-fired baseload in the future⁶.

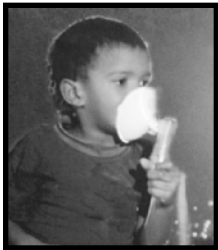


Photo by SEED Coalition

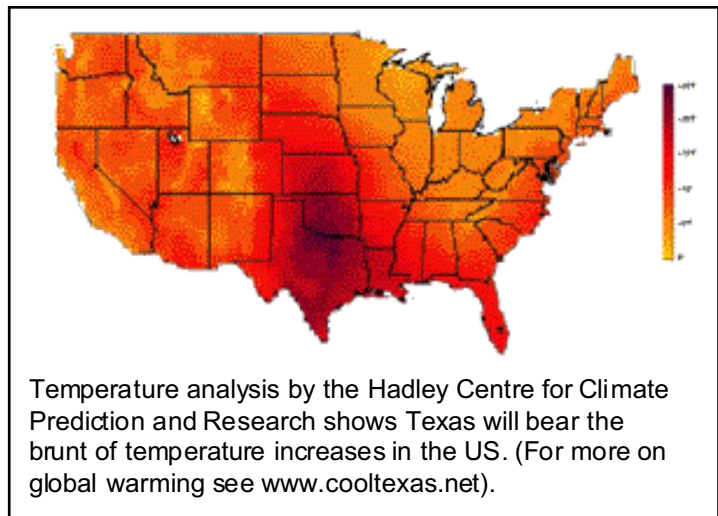
Urban Air Quality

Half of all Texans live in cities whose air quality fails to meet federal standards designed to protect public health. Poor air puts Texans' lives at risk and creates untold costs in health care and lost human production. According to Abt Associates, a consulting firm for the Environmental Protection Agency, air pollution costs 1,300 Texans their lives each year⁷. A 1999 study by the Houston Mayor's office found that reducing ozone pollution to comply with national standards would save 435 lives, avoid 1.1 million cases of pediatric asthma and save roughly \$3 billion in health care costs.

Emission	Problems	Impacts
SO ₂ , NO _x	Fine Particulates	<ul style="list-style-type: none"> regional haze lung and heart disease
NO _x , VOCs	Ozone Smog	<ul style="list-style-type: none"> respiratory disease, permanent lung damage
CO ₂	Climate Change	<ul style="list-style-type: none"> increases in global temperature extreme weather
Mercury, Selenium	Air Toxics	<ul style="list-style-type: none"> damage to central nervous system contaminated lakes
SO ₂ , NO _x	Acid Rain	<ul style="list-style-type: none"> degradation of soil, foliage and water bodies
Nuclear Waste	Radioactive Waste	<ul style="list-style-type: none"> health risks dangerous to store, transport

Global Warming

Global warming is expected to raise the global average temperature by 3 to 10 degrees Fahrenheit by the end of the century, according to the Intergovernmental Panel on Climate Change⁸. Texas' coastlines, fresh water supply, agriculture and public health are highly vulnerable even to the lower range of this warming⁹. Since renewables emit no greenhouse gases, they are a key part of the strategy to avert the most serious impacts of global warming.



Many countries around the world have already passed legislation or committed to emissions reductions and firm targets for renewable energy development. Texas could benefit from this global growth in demand for renewable energy.

Texas' Natural Heritage

Big Bend National Park, known for its seemingly endless vistas, has begun to experience significant air pollution problems from coal fired electric plants in Mexico and the United States, including east Texas. The two pictures show air quality on a good day and on a bad day. According to the National Park Service, visibility is 1/3 what it was one generation ago.



These two photos, taken from the same point in Big Bend National Park, illustrate the devastating loss of visibility due to air pollution. Plants in Mexico and Texas are the source of the obscuring emissions.



Water Quality and Recreational Fishing

Mercury emitted by industrial plants, particularly coal-fired power plants, collects in lakes and makes fish dangerous to eat. Eleven lakes in Texas carry advisories against eating the fish due to mercury. Leaders in the recreational fishing industry, which is worth \$6 billion to Texas' economy, are growing increasingly concerned about water quality and public health.

Water Consumption

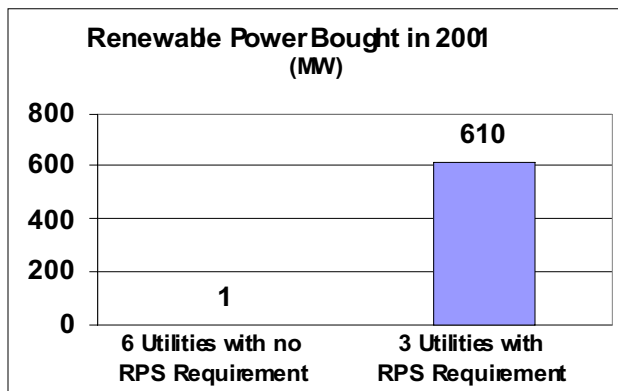
Unlike conventional steam power plants fueled by coal, natural gas and uranium, wind turbines do not require water for operation. Conventional electric utility power plants represent the single largest user of water among any industrial, governmental or residential activity. Although most of this water is returned to its source, a significant amount of water—309 million gallons each day—is consumed and lost to evaporation¹⁰.

In the summer of 2000, some plants in west Texas were forced to curtail operations due to a shortage of cooling water brought about by the long-term drought.

Why Texas' Renewable Policy Is Succeeding

The Texas Legislature passed sweeping legislation in 1999 to revise the state's electric industry. One of the provisions of this bill called for the Texas Public Utility Commission (PUC) to devise and implement a Renewable Portfolio Standard (RPS) that would ensure a minimal percentage of electricity in Texas would come from new renewable resources.

The Texas RPS is a market-based policy mechanism that requires electric retailers (as opposed to generators or transmission providers—all separated under Texas' electric restructuring legislation) to gradually increase the portion of electricity they provide from renewable resources such as wind, biomass, geothermal, and solar energy. A number of other states besides Texas are experimenting or looking into using an RPS, but the Texas RPS is widely recognized as the most successful and is frequently pointed to at the national level as a successful model.



"Here in Texas, we've proven that a renewable standard works, and that the market will respond to it positively."

David Sibley,
former Texas State Senator and
sponsor of the Texas Deregulation Bill

An innovative Renewable Energy Credits (REC) program complements the RPS by creating a market-based incentive mechanism that drives production in the most efficient and economical manner. A Renewable Energy Credit (REC) is issued for each MWh that is metered at any generation facility that is certified as a "renewable generator" by the state PUC. Retail electric providers must obtain RECs to verify they have acquired sufficient renewable resources to meet their RPS obligations.

The innovation of tradable RECs allows electricity retailers from any part of the state to find the lowest cost resources without having to take physical delivery of the electricity. Each REC is somewhat like a stock certificate in that it is tradable and its owner may claim ownership of its attributes. This leads to a price competition for RECs that results in the most cost effective resources being developed.

The Texas RPS Stimulates Utility Action

The effectiveness of the Texas RPS in delivering new and clean electricity is unquestionable, especially when the renewable energy development by the nine largest private utilities

Firm Goals Build More Renewable Energy

Some policymakers argue we should just let the market work to develop renewable energy. However, the Texas experiment shows that a renewable portfolio standard can be much more effective than relying solely on the market.

Only 233 megawatts of renewable energy have been sold through the voluntary green power markets.

912 megawatts have been built as a result of the Renewable Energy Portfolio Standard.

in Texas are examined.

All utilities in Texas have access to the Texas REC program and federal incentives for wind power; yet only a subset of companies made significant acquisitions of wind power. In 2001, three companies subject to the RPS requirement bought a combined 610 Megawatts of renewables, which during the same time the purchases of six private sector utilities with no RPS requirement amounted to only one Megawatt of renewable energy.

The 610 MW is 200 MW more than the collective requirement for the entire state for 2001. Those utilities that had met a renewables requirement seem to have found renewables to be less expensive and more reliable, and so ended up procuring considerably more than required.

The Texas RPS Reduces Costs and Makes Voluntary Markets Viable

During the past decade, electric companies in the U.S. have experimented with a marketing concept often called “green pricing” in which customers pay a premium price for their electric utility to acquire extra quantities of renewable energy generation. The success of this approach to date has been lukewarm at best¹⁰. Texas is the first region to show potential signs of success for a voluntary market, with 233 MW of new wind power attributable to the voluntary green power market, in large part because Texas customers receive a high-quality product for the premium price. In Texas, green power pricing pays for new, 100% renewable energy. In other states, paying a green power premium may only get the consumer the promise of renewables in the future, or may not even be used to build new renewable energy plants.

The voluntary market in Texas benefits from the Texas RPS which ensures the existence of a basic market and which produces renewables at reasonable costs. In addition, Texas created a mechanism for its tradable renewable energy credits that allows fuel mix claims to be accurately substantiated by retailers. This highly authenticated system means that buyers know exactly what they are getting. This is an assurance that increases the integrity of the market.

For additional details on the Texas REC program:

Texas’ REC Program website:

<http://www.texasrenewables.com>

PUC detailed program rules:

<http://www.puc.state.tx.us/rules/subrules/electric/25.173/25.173ei.cfm>

What Renewable Energy Could Do For Texas

A goal for renewable energy to supply 10% of energy needs is shared by many groups. The Texas Renewable Energy Industries Association has a 10% goal by 2020, as do Public Citizen's Texas office and the SEED Coalition. The United States Senate passed an Energy Bill in the spring of 2002 with a 10% goal for renewable energy over a similar timeline.

The economic analysis prepared for this report asked what the economic benefits would be if Texas got 10% of its electricity from renewable energy. The economic analysis assumes that Texas will more **aggressively seize wind development** opportunities. There is growing public recognition of the benefits of wind power and therefore growing political support. If Texas can enable appropriate transmission corridors to serve as wind farm to market roads, Texas can continue as a leader in wind installations. If the world sees Texas as a large, stable market with a positive wind business climate, it will be more likely to develop more wind-related manufacturing in the state.

Some in the electric industry say that a 10% is not achievable, however they appear to be overlooking past history, in which a far more robust rate of growth has been proven possible. Experts in the wind industry agree that with the proper policies and adequate transmission, wind energy could achieve a 10% level by 2020.

Results: 10% for Texas

The 13,400 Megawatts of wind capacity needed to achieve 10% in the state's electric mix would represent a total capital investment of \$12.4 billion with a net present value of about \$6 billion. Such an investment would create 8,500 direct jobs with an annual payroll of over \$250 million. It would create another 9,800 indirect jobs, provide more than \$215 million annually in local taxes, and pay landowners in windy regions \$30 million annually.

Such a robust, comprehensive industry would mean total economic impacts of in-state wind power production could approach the \$1.4 billion annual value of wind-produced electricity by 2020 (based on 13,400 MW, assuming a 40% capacity factor, and a price of 3 cents/kWh).

Economic Benefits from Wind Power

	Current 2002	Texas RPS 2009	Target 10% 2020
Installed Megawatts	1,103	2,000	13,400
Wind in Electric Supply	1.0%	1.7%	10.0%
Direct Wind-related Jobs	2,500	3,200	8,500
Additional Indirect Jobs	2,900	3,700	9,800
Payroll Value of Direct Jobs	\$75 million	\$96 million	\$255 million
Landowner Royalties (annual)	\$2.5 million	\$4.6 million	\$30.8 million
Local Taxes (annual)	\$13.3 million	\$26.4 million	\$216 million
Value of Wind Energy (annual)	\$101 million	\$199 million	\$1.4 BILLION

KEY ASSUMPTIONS:

- (1) Data for 2002 based on actual data (EIA, tax office data, FPL Energy) or best estimates by Virtus Energy.
- (2) Wind-related jobs in 2020 assume robust, diversified in-state manufacturing; based on job intensity for Denmark; indirect jobs based on Texas Comptroller estimates.
- (3) Landowner royalties assume 2.5% royalty, 35% capacity factor and 3 cent/kWh contract price.
- (4) Local taxes assume total rate of 2.51%; no abatements; declining balance method; inflation equal 2%.

Source: Analysis by Virtus for SEED / Public Citizen's Texas office

Expanding the Manufacturing Base

At present, Texas only retains a fraction of the capital investment benefit—predominantly for towers, construction and transportation—while the majority of each dollar goes to the supplier of the wind turbine, blades and electrical equipment. If Texas were to successfully entice wind-related manufacturing to locate in-state, it could more than double the immediate impact of each dollar of wind capital invested.

While Texas is a leading supplier of steel components to the wind industry, the bulk of value – about 60% according to a 1997 EPRI study — resides in the turbine and electric equipment in the wind farm. Texas will create considerably more jobs and retain a higher fraction of economic benefits than at present if the state can attract manufacturers of these components.

Lost Manufacturing Dollars

Most of the 912 MW of turbines installed in 2001 Texas came from either Denmark or Japan, at a cost of some \$323 million.

If Texas were home to a turbine manufacturer that built the nacelles, generators and associated electronics, it would retain far more of the dollars spent on wind plants.

Source: Virtus Energy Research Associates

The potential for a Texas wind-manufacturing base is in place but has not yet neared its greatest potential. For example, the Danish company Vestas which develops, manufactures, and installs wind turbines worldwide chose to locate a new plant in Portland, Oregon because of the promise of long-term wind energy development in that region and because of incentives from local and state governments. The plant will employ up to 1,000 people. If Texas continues to be a major production region, it will have the opportunity to expand its manufacturing roles to include components like turbines.

Big Spring, Texas attempted to lure a Vestas manufacturing plant to west Texas but they lost the plant to Portland, Oregon, which benefitted from a strong state and local commitment to wind energy, creating a more promising future for the plant and its products. Clearly, local and state leaders have a major role in influencing the decisions of major manufacturers, as the following statement from Johannes Poulsen, Managing Director of Vestas Wind Systems A/S shows:

“The strong regional support of wind energy generation and considerable support for the extension of the Production Tax Credit, made by particularly Governor John A. Kitzhaber and his staff, Portland Mayor Vera Katz and staff, Port of Portland Director Mr. Bill Wyatt has confirmed our belief that Portland and Oregon is a good strategic fit for Vestas.”

Renewable Energy Needs Stable and Consistent Policies To Flourish

Other nations have seen significant development of renewable energy as a result of long-term goals and commitments to the energy source. Similarly, in the United States traditional energy supplies have benefited from long-standing commitments in the form of subsidies and other supports. The United States should make a similarly strong commitment to renewable energy. The following policies are a good start for doing so.

Setting a 10% Goal for Renewable Energy (Renewable Portfolio Standard)

The 2,000 Megawatt mandatory requirement set by the Texas Legislature is viewed as a national model because of the flexibility it contained and the benefits it brought to the industry's development. The goal provided utility companies, wind companies and developers the assurance that the state had a commitment to developing renewables, encouraging these companies to invest the best technologies and systems available.

Traditional energy sources in the United States—oil, coal and nuclear—are supported with about \$33 billion in subsidies each year.

In contrast, the National Energy Policy passed by the House of Representatives in 2001 proposed just \$3 billion for alternative energy sources.

Sources:
"Running on Empty", Green Scissors Project, January 31, 2002,
"Polluter Payday", U.S. Public Interest Research Group, November 2001.

Instead of wind farms going up a few turbines at a time, Texas wind power plants are built on a large scale, allowing investors to capture the benefits of economies of scale. As the large-scale plants brought costs down, each subsequent developer benefited. In addition, the long term goal in Texas resulted in high-quality companies settling into the wind businesses, companies dedicated to quality and service asso-

ciated with products that must last and for which there will be a long-term market.

The greatest wisdom in the Texas Legislature's policy was harnessing market forces to achieve these goals at the lowest cost. Companies required to have 3% of their electricity come from renewables are left to do so in the most cost-effective manner possible.

The 3% goal for renewables has also shown that the economic benefits of wind power are significant. But only a tiny fraction of Texas' renewable energy potential has been tapped. If the goal for renewable energy were to expand to 10%, the benefits would be very powerful. As the research by Virtus Energy Research Associates indicates, a 10% goal by 2020 would employ nearly 20,000 Texans with an annual payroll of over \$250 million, and pay \$216 million into local government coffers each year.

The success of the Texas wind industry in 2001, 912 MW in a single year, makes the 2009 Texas RPS goal appear mild in comparison. If Texas were to simply match the level of activity demonstrated in 2001— with no increase in the rate of future growth — it would result in more than 18,000 MW of wind capacity in 2020, considerably in excess of the 13,400 MW needed to achieve 10% of the state's energy in 2020. Moreover,

additional renewable energy resources such as solar and biomass are expected to make valuable contributions in the decades ahead. Clearly, 10% renewables by 2020 is an achievable goal that will benefit Texas.

A 10% RPS goal by 2020 is a realistic, sustainable path for policymakers and the industry to follow. It doesn't rush the development of an industry that has a long and promising future. It gives electric providers plenty of time to reach the goals. And it will give Texas a lasting gift from today's policymakers.

While Texas can and should expand its goal to reach 10% by 2020, the federal government can also set goals. As of August 2002 Congress is debating creating a national Renewable Portfolio Standard based on the Texas model. This would create benefits to Texas in addition to whatever state policy is expanded here, because with a national standard the entire country would become a potential market for Texas renewables. Utilities from states with limited or costly renewable resources would be able to invest in Texas renewables, earning the credit for themselves and creating new revenues and new jobs for Texans. In light of the tremendous benefits derived from clean, homegrown energy supplies, it would be unfortunate if Texas – home to some of the lowest cost wind power in the world – was not prepared to seize this possible opportunity.

Extending the Production Tax Credit

Originally introduced through the Energy Policy Act of 1992, the federal Production Tax Credit (PTC) authorizes qualified owners of wind power projects to claim a tax credit on their corporate income tax returns. The credit is worth 1.5¢ per kilowatt-hour of production for the first ten years of operation.

The PTC, especially when coupled with RPS-driven economies-of-scale, makes wind power a viable, cost-competitive electric option. The availability of this substantial, publicly supported incentive offers a tremendous opportunity for Texas and other states blessed with extraordinary wind resources to reap the many benefits of local wind development while supplying clean energy to the nation.

Accelerating Construction of Transmission Lines

Transmission is vital to get power from where electricity is created to where it is used. There is simply not enough transmission capacity to move the power from the new wind power plants in west Texas to the markets where it is needed in the east.



Photo by Peter Altman

Solving Wind Transmission Constraints:

- Initiate regular evaluation of Texas' transmission needs on a five year time horizon basis
- Provide wind power priority access to existing transmission lines
- Begin constructing transmission lines to windy sites before, not after the site is developed.

In part this is a simple timing problem. Traditional fossil-fuel plants take several years to design and build. Transmission lines take several years to get through permitting, right-of-way and other administrative procedures. In the case of fossil-fuel plants, the timing matches and transmission has not been a problem.

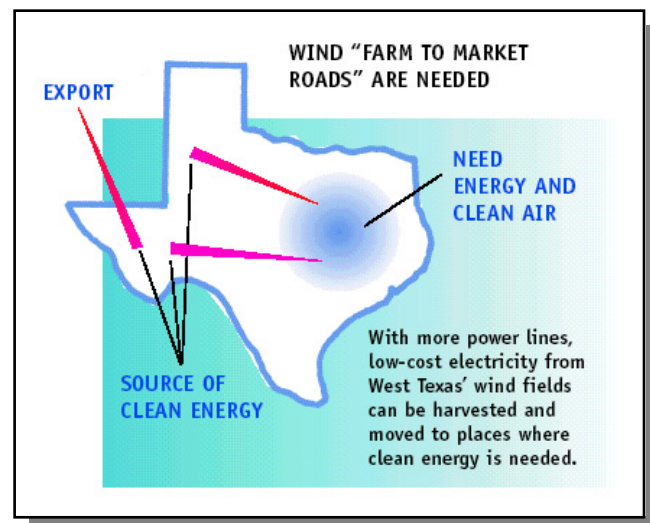
However, wind plants are quickly built – most in about a year but in some cases in as few as three months. The lag time between the construction of our new wind plants and when transmission will be available is creating a severe bottleneck in west Texas, where practically all of Texas' good wind resources are found. The transfer of power out of West Texas is currently limited to about 1,100 MW. Much if not all of this capacity is already consumed by existing power plants.

An extreme example of the bottleneck can be found in the McCamey area. The mesas around McCamey are home to 760 MW of wind farms, but the maximum transport out of this region is only 330 MW. Upgrading existing power lines and building new ones will fix the problem eventually, but these improvements are taking longer than originally anticipated and remain several years away. In the meantime, more than half of the low-cost wind capacity in this area is at times forced to shut down because there is not enough room on power lines.

There must be substantial, timely improvements to the West Texas transmission grid if Texas is to seriously develop its vast wind potential. In order to make sure that transmission capacity is built where it will be needed, Texas should develop a Statewide Wind Transmission Plan that anticipates development of these resources and times the construction to match the startup of new plants.

Emissions and Reductions Registry

Texas should seize opportunities to increase its renewable energy development with market-based approaches as well as firm goals. Currently, the global demand for clean energy is



Renewable Energy Standards and Targets Around the World

Country	Renewable Energy Standard	Target	EU Targets by 2010*
Australia	✓	2% by 2010	-
Belgium	—	3% by 2004	6%
Denmark		50% by 2030	29%
Egypt		3% by 2010	-
France		10,000 MW by 2010	21%
Germany		50% by 2050	13%
Ireland		500 MW by 2005	13%
Italy	✓	2% of new generation	25%
Japan	—	7% by 2010	-
Netherlands		10% by 2020	9%
Poland	✓	14% by 2020	-
Scotland	✓	20% by 2020	10%
Spain		12% by 2010	29%
Sweden			60%
UK	✓	20% by 2020	10%

✓ Policy implemented — Policy in process of being implemented
* See text box.

Courtesy of Union of Concerned Scientists

growing rapidly. Many countries and companies have set emissions reduction targets that can be met by using renewable energy. As world policymakers set their sights on curbing global warming, and as the Kyoto Protocol is ratified, the need for clean energy will increase even more. The Environmental Protection Agency has an emerging policy that would give credit for reducing nitrogen oxides and other pollutants through the use of renewable energy.

“There is every reason to believe a sizable GHG market will evolve in America too, even if it never signs the Kyoto Protocol.”

*Fortune Magazine,
September 2002*

Texas can cash in on this because of the quality of Texas' Renewable Energy Credit system. The Texas system is highly authenticated and thus highly respected – meaning that in the end, Texas Renewable Energy Credits have a high value. Because greenhouse gases are global pollutants, reduction projects can take place anywhere and be funded by anyone. The long-term rewards could be very high if Texas makes itself an attractive place for outside companies and countries to invest in renewables.

One of the most important things that Texas is missing however, is a statewide comprehensive greenhouse gas and emissions reduction registry. The registry is an important piece for traders to have to fully verify emissions reductions as well as make new investment decisions.

Job Training

Texans can assure the maximum benefit by making sure young people get the training and education opportunities they need. Employment candidates with background in mechanics, hydraulics, electronics, and computer maintenance will have advantages in the hiring process for the renewable energy industry. Much as Texas universities have career tracks for the oil and gas industry, the state could develop and support programs in certified wind turbine technology, renewables engineering and other curricula. Other employment opportunities in the growing renewables industry include careers in meteorology, economics, public relations, engineering, real estate and law.



“If kids have an understanding of mechanics, hydraulics, electronics or computers systems, these are long-term jobs . . . 25 year careers for our young people.”

**Randy Sowell,
Cielo Wind Power**

Photo by Peter Altman

How Consistent and Stable Policies Have Built an Industry – in Denmark

For two decades, Denmark has championed aggressive policies to nurture its wind industry. These policies have paid big dividends to this small country, whose size and population roughly equal to that of the greater Houston area. Since the inconsistent policies of the United States allowed Denmark to take world leadership in wind technology during the late 1980's, Denmark has consistently supplied 50% of the world's wind turbines, with sales of nearly \$3 billion during 2001.

In 1996, the Danish Wind Turbine Manufacturers Association completed an in-depth study of direct and indirect employment from the manufacture and installation of turbines. In 1991 and 1995, Denmark installed 413 and 619 MW of turbines respectively. For those two years, employment was estimated at 3,100 and 8,500, respectively. In 2001, the total direct and indirect employment from wind turbine manufacturing in Denmark was estimated at 20,000.

In contrast, policies in the United States have wavered over the years, providing little certainty and confidence for investors and renewable companies themselves. The result is that the industry is littered with bankruptcies and expensive new startups, ramping up in years when the policy support is there and laying off workers when support wanes.

<i>Top 7 Wind Turbine Manufacturers from the 1980's – Where They are Today</i>		
Company	Nation	Status of Company in 2002
US Windpower	USA	Bankrupt - 1996
Vestas	Denmark	#1st in World Market Share
Fayette	USA	Bankrupt - 1993
NEG Micon	Denmark	#4th in World Market Share
Flowind	USA	Bankrupt - 1997
Mitsubishi	Japan	# 13th in World Market Share
Bonus	Denmark	# 5th in World Market Share
<i>Rankings based on from 1981-1989 statistics for California, which represented 88% of the World market over that period.</i>		
Source: Analysis by Virtus for SEED / Public Citizen's Texas office		

Conclusion

Renewable energy is already showing it can fulfill a great promise for Texas. It is revitalizing west Texas economies withered from drought and depletion of oil and gas supplies. It is creating pockets of manufacturing, construction and technology jobs all over Texas. It is also demonstrating that pollution-free energy sources are economical and effective. All that remains to fulfill the promise is the will of Texas' leaders to put forward and stand by clear and stable policies.

The Texas RPS has been very successful at stimulating rapid development of clean renewable generation at prices that are competitive with fossil fuel fired generation. If Texas were to become a true powerhouse in

wind energy, the benefits could be even greater than indicated above. The export of wind components and technology will become an increasingly important global industry. Texas is well positioned to capitalize on this opportunity with timely action by state government and business community leaders. Renewables can create these economic opportunities if Texas decision-makers continue to support its growth. Proven policies that can help Texas accomplish the achievable goal of 10% of electric production from wind power by 2020 are:

- 1) Stimulate cost-effective development by setting state and federal goals for renewables to meet 10% of our electricity use by 2020;
- 2) Add transmission infrastructure to move wind-generated power to cities;
- 3) Extend the federal Production Tax Credit long-term;
- 4) Create a verifiable registry of emissions and reductions to make Texas more appealing to pollution credit driven renewables development;
- 5) Create and support university and other training programs to prepare Texans to work in the renewable energy industry.

Renewable energy is providing great economic value for Texans. With clear and deliberate goals, renewable energy can grow to a multi-billion dollar industry that puts Texans all over the state to work. Leadership is all that is needed.

Texas is Poised for Global Leadership

Overall, Texas has the best potential to create energy from renewables and the costs are relatively low in Texas. If a national renewables goal is set, Texas could benefit by building renewables for companies all over the United States.

And just as Texas has been a world leader in the oil and gas industries for the last century, so it can be the leader in renewable energy for the next century. Globally the demand for clean energy is increasing at a rapid rate. Many countries are adopting renewable energy mandates or emissions reductions laws, and they will need clean energy to meet their goals. Texas renewable technology, products and systems can meet that demand.

In addition, Texas' Renewable Energy Credit system is highly valued by companies that trade pollution credits because the system is well-verified. Texas could be the home of many new projects initiated purely for the production and sale of pollution credits.

Appendix: Methodology of Economic Analysis

The analysis performed by Virtus Energy for Public Citizen/SEED focused on quantification of current benefits attributable to the wind power industry in Texas. The statements of current benefits are based on information reported by public authorities and industry experts as well as estimates derived from current industry trends. The strengths of the analysis are: (1) identification of Texas current wind projects (2) estimation of local school taxes to be paid (3) cost comparison with utility fuel costs in Texas, and (4) job intensity factors based on construction and operation & maintenance of real wind projects in Texas.

Future economic outlooks are more difficult to develop due to the number of factors that may affect what actually happens. The future projections in this report are based on reasonable expectations of prices, development opportunities business decisions and other factors. The analysis does assume that with the large added volume of renewable development more manufacturers will locate in Texas, including turbine manufacturing. It is noted that in this analysis future dollar values are neither discounted nor inflated (the exception being projections of future local tax benefits). Alternatively, the results can be interpreted assuming that the inflation rate equals the discount rate. While this is an unconventional approach, Shimon Aurbach has championed the use of very low “risk-adjusted” discount rates for predictable, stable priced renewable energy resources. But for the purposes here, a more simplistic approach is intended. It is suggested to interpret the scale of the quoted future benefits by simply considering the future quantity of wind power as if it were installed in the present.

NOTES:

(1) Installed Megawatts - based on inventory of current wind sites by Virtus Energy; assumption of 2,000 MW of Wind in 2009; value in 2020 based on 10% of EIA projection of Texas Electricity Sales being met with in-state wind resources operating at 40% capacity factor.

(2) Wind in Electric Supply – EIA projections for Texas Electric Sales with the following capacity factors: 35% in 2002; 38% in 2009; 40% in 2020. It is noted that the current crop of wind projects in Texas are reportedly performing better than the state's administratively assigned capacity conversion factor of 35%, but several projects in the McCamey area are experiencing lower output due to being involuntarily curtailed because of transmission shortages. Since performance data and curtailment data are generally considered proprietary, a 2002 value of 35% is used throughout the analysis.

(3) Direct Wind-related Jobs – Current jobs based on a combination of approaches: construction job intensity (1.3 man-years/MW) from FPLE detailed labor data for King Mountain and Woodward Mountain wind projects, operations & maintenance labor intensity (0.06 jobs/MW) based on average value from survey of Texas projects, manufacturing jobs based on interviews with major Texas companies, all other wind-related jobs based on interview and estimates by Virtus Energy of Texas Renewable Energy Industries Association members. Wind-related jobs in 2020 assume robust, diversified in-state manufacturing based on job intensity for Denmark (5.7 jobs/MW produced) plus construction job intensity (1.3) with moderate labor efficiency increase to a combined manufacturing and construction job intensity of 6 jobs/MW, 1200 MW sustained annual production and installation with a 7% growth in all other wind jobs.

(4) Indirect Wind-related Jobs – based on “first-cut” estimates made by Texas Comptroller for indirect impact of wind-related manufacturing and construction (1.15 indirect jobs for every direct wind job)

(5) Value of Payroll – assumed value = \$30,000 per year average annual wage, rooted in U.S. Department of Labor statistics for Texas construction trades and structural metal and fiberglass related manufacturing

(6) Landowner Royalties — Landowner income assume 2.5% royalty, 35% capacity factor and 3 cent/kWh contract price for all years.

(7) Local Taxes - 2002 values are based on data obtained from county tax offices and other supplemental sources. Most of the current crop of wind projects have partial tax abatements during the first 5 to 10 years. Projection of future taxes inherently reflects substantial uncertainty since it is contingent on future tax rates, asset valuations, abatement policy and sequencing of new wind farm construction. Future tax values represent what are considered to be upper values and are based on the following assumptions: total tax rate of 2.51% with no abatements, 25 year asset declining balance schedule with inflation rate of 2% (approach taken to roughly mimic observed pattern of valuation of wind assets in several Texas counties), new wind installations assume a maximum sustained level of 1200 MW per year by 2020.

(8) Value of Wind Energy – assume the following capacity factors: 35% in 2002; 38% in 2009; 40% in 2020; and 3 cent/kWh contract price for all years.

Endnotes

¹ The economic figures in this section and throughout the report were researched or compiled by Virtus Energy Research Associates for the SEED Coalition and Public Citizen's Texas office, except where otherwise noted. Virtus' methodology is described in the appendix.

² Based on data provided by FPL Energy for the construction of King Mountain and Woodward Mountain wind projects.

³ "Energy Efficiency and Renewable Energy Technologies as an Economic Development Strategy for Texas," December 98. Prepared by Economic Research Associates.

⁴ Based on estimates made in personal communication to Virtus by the Revenue Estimating Division of the office of the Texas Comptroller of Public Accounts in August 2002.

⁶ "Renewing Texas", Union of Concerned Scientists, August 2002. <http://www.ucsusa.org>

⁶ "Unplugging Texas' Most Powerful Polluters", Public Citizen's Texas Office and SEED Coalition, July 2002. <http://www.citizen.org/documents/Our%20Unplugged%20Final.pdf>

⁷ Mortality figure for Texas from "Death, Disease and Dirty Power" by Clear the Air at <http://www.cleartheair.org>

⁸ The IPCC's 3rd Assessment of the impacts of global warming found a higher than previously expected range for temperature increases. See <http://www.ipcc.ch>.

⁹ Various analyses have examined global warming's impacts on Texas. See <http://www.cooltexas.net> for more impacts and source material, as well as <http://www.ucsusa.org> for a recent study by the Union of Concerned Scientists and the Ecological Society of America.

¹⁰ Solley, Wayne B., Pierce, Robert R., and Perlman, Howard A., *Estimated Use of Water in the United States in 1995*. United States Geological Society. p. 53. Available online at <http://water.usgs.gov/watuse/pdf1995/html/>

¹¹ "Unplugging Texas' Most Powerful Polluters", Public Citizen's Texas Office and SEED Coalition, July 2002. <http://www.citizen.org/documents/Our%20Unplugged%20Final.pdf>

Web Links

- SEED Coalition: <http://www.seedcoalition.org>
- Public Citizen's Texas office: <http://www.citizen.org/Texas>
- Union of Concerned Scientists: <http://www.ucsusa.org>
- State of Texas site on renewable energy: <http://www.infinitepower.org>
- American Wind Energy Association: <http://www.awea.org>
- Texas Renewable Energy Industries Association: <http://www.treia.org>
- List of Texas wind projects: <http://http://www.awea.org/projects/texas.html> www.awea.org/projects/texas.html
- Fact sheet on Southwest Mesa wind project: <http://www.awea.org/projects/summaries/SWMWE.pdf>
- On-line tour of Trent Mesa wind project: <http://www.trentmesa.com/>
- On-line tour of Desert Sky wind project: <http://www.desertskywind.com/>
- Lower Colorado River Authority's Wind Power pages: <http://www.lcra.org/energy/windproj.html>
- Texas General Land Office wind page: <http://www.glo.state.tx.us/sustain/wind.html>

About Public Citizen's Texas office

Since 1984, Public Citizen's Texas State Office has concerned itself with: environmental enforcement policies, global warming, promoting renewable/clean energy, product safety, nuclear safety, medical safety, auto safety/quality, pesticide safety, insurance reforms, campaign finance/ethics issues, improving state government agency operations and fair trade policies. We have trained over 175 interns and have worked with/mentored numerous grassroots organizations.



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About the Sustainable Energy and Economic Development (SEED) Coalition

Texas leads the nation in emissions of many harmful air pollutants, but also ranks first in potential to meet energy needs with clean sources. Since 1993, the SEED Coalition has been dedicated to building a sustainable future. SEED focuses on reducing pollution from the energy and transportation industries and promoting the clean alternatives that put Texans to work. By educating and organizing with citizens who share these goals, we are creating a future with less pollution and more clean jobs.



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